OPIC
OFFICE DE LA PROPRIÉTÉ INTELLECTUELLE DU CANADA

CIPO
CANADIAN INTELLECTUAL PROPERTY OFFICE

OTTAWA HULL K1A 0C9

(11) (C) 2,026,269
(22) 1990/09/26
(43) 1991/06/22
(45) 1994/08/23
(52) 354-41

(51) INTL.CL.[5] G06F-015/30

(19) (CA) **CANADIAN PATENT** (12)

(54) Machine Method of Balancing Credit and Debit Transactions

(72) Duffield, Daniel A. , Canada

(73) NCR Corporation , U.S.A.

(30) (US) U.S.A. 454,715 1989/12/21

(57) 9 Claims

ABSTRACT OF THE DISCLOSURE

A method of assisting an operator in balancing large transactions with subtotals as occurs in the banking industry. A typical deposit for a bank may include several bundles of checks, with each bundle being wrapped in an adding machine tape which has thereon a total monetary amount for the checks included in that bundle, and it also includes a deposit slip which includes a grand total of the monetary amounts of all the groups of checks associated with the deposit slip. Balancing such a large transaction is performed on a bank proofing machine. A Proof Total (associated with the grand total) and a Subtransaction Total (associated with each group of documents being run) are maintained to assist an operator in finding an error when one does occur. The current "adding machine mode" of balancing is discussed for comparison with the method of this invention.

2026269

A MACHINE METHOD OF BALANCING CREDIT AND DEBIT TRANSACTIONS

Background of the Invention

(1) Field of the Invention: This invention relates to a method of assisting an operator in balancing large transactions with subtotals as occurs, for example, on proof machines in the banking industry.

(2) Background Information: One way in which balancing large transactions with subtotals occurs is through making deposits of checks at a bank. For example, several stores belonging to a chain of stores in a city-wide area may forward the checks to a "collecting store" within the chain of stores. The monetary amounts of the checks received at a particular store for a particular day are added together on an adding machine. The checks are then grouped together to form a bundle of checks, with the associated adding machine tape, showing the total of all checks within the bundle, being wrapped around the bundle of checks. These bundles of checks with the associated "tape totals" are forwarded to the collecting store.

At the collecting store, the tape totals mentioned are added together by an operator who arrives at a total deposit for that day for all the stores in the area. The operator then makes out one bank deposit slip showing a total for all the bundles of checks received. The deposit slip with the total thereon and the bundles of checks with the associated adding machine tapes thereon are then deposited in the bank where the chain of stores has an account.

When the bank processes the deposit just mentioned, the bank considers the deposit slip as a total deposit, and it considers the total on each bundle of checks as a subtotal. From the bank's point of view, the deposit slip is considered a "credit" and each individual check within a bundle of checks is

considered a "debit" from an accounting standpoint. The bank then balances the transactions associated with the deposit, making sure that deposit is accurately handled by the bank.

There are currently two common methods typically used by banks in balancing transactions of the type mentioned. One method requires using a lot of "no-sort credits and reversing them". The other method relates to an "adding machine mode". These processes are not user friendly and require additional operator keyboard entries. As a result, some operators use them only when deemed absolutely necessary, and some other operators don't even try. The operators hope that they can encode or enter the entire transaction without an "out-of-proof" or "out-of balance" problem occurring. In a recent study, large transactions which include more than 75 checks in the transaction accounted for about 29% of the deposits to be handled by banks.

The "adding machine mode" for handling bank deposits (alluded to earlier herein) is used by about 60% of the banks in the U.S.A. In general, there are two totals run in this mode; they are the "proof total" and the "adding machine total". This mode of operation is easiest to describe by showing an example of the actual transactions involved. However, before showing an example, it would be useful to review a glossary of terms which are used herein. The terms are as follows:

(1) Item: A debit or credit, usually associated with one document.

(2) Transaction: A deposit, usually made up of one credit and one or more debits.

(3) Bundle: A group of one or more transactions bound together, usually with an elastic band.

(4) Subtransaction: A group of debits which have an associated subtotal value.

(5) Overall transaction: A transaction with zero or more subtransactions contained in it.

For the sake of simplicity, assume that there are 10 groups of checks being deposited, with each group having a subtotal of $100.00 thereon, and with the associated deposit slip having a total of $1,000.00 thereon for the entire deposit or bundle. In the example which follows, there are two columns shown; the first is entitled "Proof Mode" and the second is entitled "Adding Machine Mode". The Proof Mode shows a proof total and the Adding Machine Mode shows an adding machine total. The individual transactions which are entered are numbered and shown within parenthesis.

PRIOR ART METHOD

	PROOF MODE	ADDING MACHINE MODE
(1)	1,000 Cr (-)	
		ADDING MACHINE MODE ON
(2)		1,000 Cr (-)
(3)		100 Dr (+)
		———
(4)		900 (-)
(5)		ADDING MACHINE MODE OFF
(6)	50 Dr (+)	
(7)	25 Dr (+)	
(8)	25 Dr (+)	
(9)	Press Proof Subtotal	
	———	
(10)	900 Cr (-)	
(11)		ADDING MACHINE MODE ON
(12)		Press Add Mach Subtotal
		= 900 Cr (-)
(13)	Visual comparison	
	900 Cr (-) =	900 Cr (-)

(14) Repeat process of transactions (3)-(13) for groups of checks #2 - #10.

(n) Visual comparison of the tenth group of checks, assuming that no errors were made in processing the transaction.

PROOF MODE	ADDING MACHINE MODE
0 Cr (-) =	0 Cr (-)

Following the transactions listed above, the operator at the bank would perform the following transactions.

The machine on which the data is entered may be a single pocket proof machine, for example, and it has two modes of operation namely, a Proof Mode and an Adding Machine Mode.

At (1), the operator enters the Proof Total Mode and then enters $1,000 as a credit (-) for the deposit slip which is supplied with the ten groups of checks. This is shown under Proof Total.

At (2), the operator switches to the Adding Machine Mode on the machine by actuating a particular key (On/Off) thereon to indicate this selection. When this key is Off, the Proof Mode is active, and when it is on, the Adding Machine Mode is active. The $1,000 is entered as a credit (-) under Adding Machine Total.

At (3), the $100 subtotal for the first group of checks is entered as a debit (+). The operator is in the Adding Machine Mode.

At (4), the subtotal key is actuated to leave a balance of $900 (-) as credit in the Adding Machine Total.

At (5), the On/Off key is actuated to place the machine back into the Proof Mode from which the individual check amounts for the first group of checks will be entered.

At (6), the monetary amount of $50 for the first check is entered as a debit or (+) transaction.

At (7), the monetary amount of $25 for the second check is entered as a debit or (+) transaction.

At (8), the monetary amount of $25 for the third check is entered as a debit or (+) transaction. This is the last check in the first group of checks in the example being described.

At (9), the operator actuates a Proof Subtotal key which shows the running proof total; this is the credit (-1000.00) plus the debits.

At (10), the machine indicates a $900 balance or Proof Total.

At (11), the operator actuates the On/Off key to place the machine in the Adding Machine Mode.

At (12), the operator actuates adding machine subtotal key to indicate the current adding machine total which is shown as $900 as a credit (-).

At (13), the operator visually compares the Proof Total of $900 Cr (-) with the Adding Machine Total of $900 Cr (-). These values are shown on a journal tape associated with the machine. Because these values are equal, the operator proceeds to process the second group of checks.

At (14), the operator repeats the process of transactions (3-13) for the remaining groups of checks #2 through #10 in the example being described. Because these steps are similar to those already described, they are not repeated here.

Eventually, a transaction (n) will be reached in which a visual comparison is made for the entire transaction after the ten groups of checks have been processed as described. Assuming that all the subtotals and transactions have been recorded correctly, a 0 Proof Total will equal a 0 Adding Machine Total. The operator may then go on to process the next deposit as described.

One of the problems mentioned with the method just described is that it is necessary for the

operator to continually switch from one mode of operation (the Proof Mode) to the other mode (the Adding Machine Mode). This switching tends to confuse some operators, and as a result, the operator may not use this method of balancing the transactions. Another problem is that when the machine is put into the Adding Machine Mode, the machine is occupied with this activity and can't be used effectively for other machine operations. Another problem with this method is that it is difficult to utilize existing "reconciliation" techniques in trying to find the cause of an error when one or more does occur. The following are some additional problems which exist in using the prior art method mentioned:

(1) There is no way of assuring that an operator keys the correct value for the subtotal while in the Adding Machine Mode. This will cause the operator to look for an error which does not exist.

(2) If an error was found and corrected in one of the groups of checks, the Proof Total and the Adding Machine Total will be out of sync.

(3) The act of visually comparing two numbers or amounts may let a mismatch through the system. For example, the amounts $1080.00 and $1008.00 may not be noticed as being different by an operator.

The other method used by banks in balancing transactions of the type mentioned is referred to as the "no-sorts credits with a lot of reversals". Because this method is complicated, it will not be described here in detail. Also, because it is complicated, it is used less than the "adding machine mode" method described herein.

Summary Of The Invention

In contrast with the problems mentioned, the method of the present invention is relatively easy to

use, and as a result, operators are more inclined to use this method for balancing transactions of the type mentioned.

Another advantage of this invention is that it is not necessary for an operator to switch from one mode of operation to another as is the situation with the prior art method described.

Another advantage is that the method of this invention is compatible with existing reconciliation techniques which are designed to locate an error or errors when at least one is found in balancing the transactions.

In a preferred embodiment of the invention, there is provided a machine method of balancing credit and debit transactions associated with documents in which one credit document and more than one group of debit documents are provided; each document of said group of debit documents having a numerical value associated therewith and each said group of debit documents having a subtotal associated therewith, with the subtotal representing the sum of the numerical values of the documents included in that group of debit documents, and with said one credit document having a total which represents the sum of the subtotals of each said group of debit documents, said method comprising the steps:

(a) entering on a machine a credit, as a negative transaction, said total from said credit document,

(b) entering on said machine a credit, as a negative transaction, one of said subtotals associated with a group of debit documents to be balanced;

(c) entering on said machine a debit, as a positive transaction, the numerical value of a first document included in the group of documents mentioned in step (b);

(d) using said machine when in a first mode of operation to subtract said numerical value mentioned in step (c) from the subtotal mentioned in step (b) to arrive at a subtransaction total, and to also subtract said numerical value mentioned in step (c) from said credit mentioned in step (a) to arrive at an overall running total or second output;

(e) repeating steps (c) and (d) for the documents remaining in the group mentioned in step (b);

(f) checking said subtransaction total to determine whether or not subtracting said debits of said documents in the group of documents mentioned in step (c) results in an output which is equal to zero for the group of documents from group (b);

(g) repeating said steps (b), (c), (d), (e), and (f) for the groups of debit documents associated with said credit document; and

(h) checking said second output of said machine to determine whether or not said second output is zero when all the debit documents for all the groups of debit documents have been processed in step (g).

The above advantages and others will be more readily understood in connection with the following description, claims, and drawing.

Brief Description Of The Drawing

The only figure shown is a general block diagram of a terminal or apparatus upon which the preferred method of this invention may be practiced.

Description Of The Preferred Embodiment

As previously stated, a machine or terminal 10 which may be used in conjunction with this invention may be a proof machine which is used by the banking industry, with the terminal 10 being shown

only diagrammatically in the figure . Before describing the method of this invention, it would appear to be useful to describe the terminal 10 itself.

The terminal 10 includes a read only memory (ROM) 12, a random access memory (RAM) 14, a microprocessor (MP) 16, an optional display 18, and interfaces 20, 22, and 24 which are interconnected by suitable interface and control logic 26 as shown in the figure to enable the terminal 10 to function as an intelligent terminal. The interface 20 is used to couple a printer 28 (which functions as a display) to the terminal 10, and similarly, the interface 22 is used to couple a keyboard 30 to the terminal 10. Interface 24 couples a document transport 32 to the terminal 10 which may be a stand alone terminal or the terminal 10 may be coupled to a host computer 34 via an interface 36. The software or programs for operating the terminal 10 may reside in the ROM 12, for example.

The document transport 32 is conventional and includes the usual document track, feed rollers, and driving motor (not shown) for moving a document 38 along the document track and into a pocket 40 of the terminal 10.

The printer 28 includes a journal tape 42 which is used to record the transactions which were discussed in the Background Information. A light 44 on the terminal 10 is used to indicate certain conditions during the transactions to be later described herein.

The keyboard 30 includes a plurality of keys 30-1 which include the usual alpha-numeric keys, and it also includes the following control keys whose usage will be described hereinafter. The control keys include a Subtotal key 30-2, a Non-Add Subtotal key 30-3, a Reverse Enter key 30-4, a Debit key 30-5, a Credit key 30-6, and an Error Release key 30-7.

In order to describe the method of this invention, it will be useful to describe it in the same general format as was used in the Background Information. In this regard, there are two totals which are used in the balancing of large transactions with subtotals. There is a "Proof Total", and there is a "Subtransaction Total". Assume that there are three groups of checks in a bundle in Example #1, with each group of checks having a total for the monetary amounts of the checks included in the group, and with the total for the three groups appearing on an adding machine tape wrapped around the bundle of checks.

Example # 1 which will be discussed in relation to the method of this invention is one in which there are no proof errors in the total transaction. In addition to the amounts mentioned in the previous paragraph, the example will include a column which indicates the status of the light 44 which indicates the status of the transaction being processed. The example will also include a column for "Journal" which is used to record certain conditions associated with the processing to be described. These conditions are recorded on the journal tape 42 associated with the printer 28 shown in the figure. The entries which are made are recorded by item numbers, like (1), so as to make a discussion of the item easier to follow.

Example #1

IT. NO.	ENTRY	PROOF TOTAL	SUBTRANS-ACTION TOTAL	JOURNAL	PROOF LIGHT
(1)	1000 CR	1000(-)	0		O
(2)	100 NA ST	1000(-)	100(-)		S
(3)	50 DR	950(-)	50(-)		S
(4)	50 DR	900(-)	0	(=)	F

(5)	500 NA ST	900(-)	500(-)		S
(6)	100 DR	800(-)	400(-)		S
(7)	250 DR	550(-)	150(-)		S
(8)	150 DR	400(-)	0	(=)	F
(9)	400 NA ST	400(-)	400(-)		S
(10)	150 DR	250(-)	250(-)		S
(11)	250 DR	0	0	(<>)	O

While the discussion of this method proceeds with regard to processing checks at a bank, this method could be applied to processing inventory cards, for example, which have totals or numerical values thereon.

Before proceeding with a detailed discussion of the method embodied in the items listed in Example #1, it is useful to indicate that there are three groups of checks or documents to be processed. The first group of checks is included in the item numbers (IT. NO.) marked (2)-(4); the second group of checks is included in the item numbers (5)-(8); and the third group of checks is included in item numbers (9)-(11). Each group of checks is wrapped in an adding machine tape which has thereon the total for all the checks included in that group of checks. In the first group of checks in Example #1, there are only two checks listed as item numbers (3) and (4). There are only a few checks included in the first, second, and third groups of checks so as to simplify the discussion of the method of this invention; however, in an actual bank transaction, there may be several hundred checks in a particular group. As stated earlier herein, in one study, it was found that large transactions which include more than 75 checks in a transaction deposit or bundle accounted for about 29% of the deposits handled by a bank. Another point to be made here is that for the three groups of checks to be deposited in

a bank, there would be one credit or deposit slip accompanying the three groups of checks, with the total on the deposit slip reflecting the sum of the subtotals of the three groups of checks.

When the deposit slip and the three groups of checks are received at a bank, the subtotal balancing is performed on a proof machine or terminal 10 as shown in the figure. The terminal 10 has two totals which are maintained; these are the Proof Total and the Subtransaction Total as shown in Example #1. With the method of this invention, it is not necessary to shift between a Proof Mode and an Adding Machine Mode as was discussed in the Background Information. In describing the method, it is easiest to refer to the item numbers appearing in the left-most column of Example #1 to describe the various steps or operations involved in the subtotal balancing.

At item (1), with the proof light 44 being off, the subtotal balancing according to this invention is begun. There are certain "housekeeping" activities which are performed prior to employing the subtotal balancing of this invention; these activities include entering the date, account number, and the like. However, because these activities are not necessary for an understanding of this invention, they are not discussed in any further detail.

The first step in the method at item (1) is to enter the monetary amount of the deposit (overall transaction) slip as a credit or negative (-) amount; in this example, the total is $1,000. The keys 30-1 are used for entering the amount, and the Credit key 30-6 is actuated to make the amount a credit or (-) entry. This sum of $1,000 was derived by adding the subtotals of check groups #1, #2, and #3 which are $100, $500, and $400, respectively, in Example #1; these check group subtotal values are found at item numbers (2), (5), and (9). The deposit slip and the

bundles or groups of checks were obviously supplied by a customer of the bank where the deposit is made.

As an aside, there are three states associated with the proof light 44; they are as follows:

"O" indicates the proofing operation is not on; it also indicates the end of processing the groups of checks associated with a deposit. The station is in balance (zero Proof and Subtransaction Totals).

"S" stands for the light 44 being "on" continuously or solid which means that the terminal 10 is processing a subtransaction or group of checks (Subtransaction Total is not zero); and

"F" stands for the light 44 "flashing on" which means that the terminal 10 is finished processing a group of checks and that the journal tape 42 should be checked to see whether or not this particular group of checks just processed is in balance. Flashing also occurs while processing overall transaction items when the Subtransaction Total is zero and the Proof Total is not zero. This will be discussed later herein.

Continuing with the subtotal balancing, the next transaction occurs at item (2). At this step, the operator is about to enter the subtotal which appears on an adding machine tape which is wrapped around an associated group of checks. Naturally, the subtotal for a group of documents may be presented in a different form; however, it is convenient to refer to the group of documents and their associated subtotal as being presented in this manner. Notice, also, that there is no credit slip (physical document) associated with the first group of documents. To enter the subtotal for the first group of documents, the operator reads the subtotal from the associated adding machine tape and enters $100 on the keys 30-1 of the keyboard 30. The operator then actuates the

Non Add Subtotal (NA ST) key 30-3 of the keyboard 30. The software associated with the terminal 10 and this invention causes the $1,000(-) which was entered at item (1) to appear under Proof Total and also causes the $100 which was entered via the NA ST key 30-3 to appear as a Subtransaction Total of $100(-). In other words, the terminal 10 includes a Proof Total associated with the deposit slip and it also runs a Subtransaction Total associated with the subtotal of the particular group of checks being processed. The proof light 44 is "S" or on continuously, indicating that the terminal 10 is handling a subtransaction.

At item (3), the operator enters $50 on the keys 30-1 as the amount of the first check in the first group of checks, and then actuates the Debit key 30-6. The software in the terminal 10 then causes the $50 debit to be "subtracted" from the $1,000 Proof Total, leaving a Proof Total balance of $950, shown as 950(-). The $ sign is left off the figures shown in Example #1 so as to simplify its showing. The software in the terminal 10 also causes the $50 debit to be subtracted from the 100(-) listed under Subtransaction Total, leaving a balance of 50(-).

At item #4, the operator enters $50 as the amount of the second check in the first group of checks and then actuates the Debit key 30-5. This second check in the Example #1 completes the items for the first group of checks in the example being described. Naturally, in some subtransactions, there may be more than 100 checks in a particular group. However, for the example being discussed, the second check of $50 entered as item (4) is subtracted from the Proof Total, leaving a balance of 900(-). This same second check value of $50 is subtracted from the Subtransaction Total leaving a balance of 0. The software in the terminal 10 recognizes that the first group of documents is in balance (ie. a subtotal

amount of 100(-) is offset by two debits of $50 each), and as a result, the terminal 10 actuates the printer 28 to print an equal sign (=) on the journal tape 42, indicating that the subtransaction is balanced. The proof light 44 would be flashing (F) at this time to remind the operator to look at the journal tape 42. Because the equal sign is present on the journal tape 42, the operator knows that the subtotal on the adding machine tape and the checks in group 1 associated with the subtotal are in balance. The operator then proceeds to process the group of checks in group 2.

The item numbers (5)-(8) shown in Example #1 are associated with the checks of group #2. The entry of data associated with these checks is identical to that already explained in relation to the checks of group #1. The subtotal of $500 at item number (5) is entered via the Non Add Subtotal key 30-3 as previously described. This $500 amount does not change the Proof Total which remains at 900(-) from the processing associated with the checks of group #1; however, it provides a new Subtransaction Total of 500(-) for this group. Notice, also, that the proof light 44 turns to "S" indicating that the terminal 10 is processing a group of checks. Item numbers (6), (7), and (8) relate to entering the amounts of the individual checks included in group #2, and as previously discussed, the individual values of these checks are "subtracted" from the Proof Total and the Subtransaction Total. After this subtraction, a balance of 400(-) remains under the Proof Total, and a balance of 0 remains under the Subtransaction Total. Notice that the proof light changes to "flashing" or "F" at item number (8), indicating that subtransaction is balanced and that the operator can look at the journal tape 42 which shows (=); this also indicates that the processing of the second group of checks is in balance.

The third group of checks in Example #1 being described is processed as previously described, and this processing is shown at item numbers (9)-(11). It should be recalled that this Example #1 did not contain any errors in processing. Accordingly, the Proof Total and the Subtransaction Total would be "0" as shown at item number (11). The proof light 44 would be turned off or "O", indicating the end of a processing of a transaction and prompting the operator to check the journal tape 42. The terminal 10 would cause the printer 28 to print a special character on the journal tape 42, like the (<>) shown under Journal, to indicate that the Proof Total and the Subtransaction Total are "0", indicating that the processing of the first transaction has been processed correctly.

Certain other operations may be performed on the group of checks while they are processed as discussed in relation to Example #1. For example, the monetary amounts entered for the checks of group #1 may also be printed in MICR ink on the associated checks, and these checks and their associated deposit slip (discussed in relation to item number (1)) are moved into the pocket 40. Because a discussion of these activities is not important to an understanding of this invention, they are not discussed in any further detail.

Having discussed the method of this invention in relation to Example #1 in which no errors in processing were encountered, it seems appropriate to discuss the method of this invention when errors are encountered. In this regard, Example #2 shows an out-of-proof error in a sub-transaction.

Example #2

IT. NO.	ENTRY	PROOF TOTAL	SUBTRANSACTION TOTAL	JOURNAL	PROOF LIGHT
(1)	1000 CR	1000(-)	0		O
(2)	100 NA ST	1000(-)	100(-)		S
(3)	50 DR	950(-)	50(-)		S
(4)	50 DR	900(-)	0	(=)	F
(5)	500 NA ST	900(-)	500(-)		S
(6)	100 DR	800(-)	400(-)		S
(7)	250 DR	550(-)	150(-)		S
(8)	200 DR	350(-)	50(+)		S *
(9)	Proof Subtotal	T-DR	650(+)		
(10)		T-CR	1,000(-)		
(11)		oop	350(-)		
(12)	Subtransaction Subtotal	T-DR	550(+)		
(13)		T-CR	500(-)		
(14)		oop	50(+)		
(15)	RV-EN 200 DR	550(-)	150(-)		S
(16)	150 DR	400(-)	0	(=)	F
(17)	400 NA ST	400(-)	400(-)		S
(18)	150 DR	250(-)	250(-)		S
(19)	250 DR	0	0	(<>)	O

* Error Tone

Example #2 presents three groups of checks which are identical to the three groups of checks associated with Example #1; however, there was an entry error in one of the subtransactions associated with a group of checks. The error occurred in the second group of checks, specifically at item number (8). Accordingly, the entries for item numbers

(1)-(7) of Example #2 are identical to the corresponding entries in Example #1, and these entries do not need to be discussed in any further detail.

As just mentioned, the error occurred at item number (8) in Example #2 in that the operator entered $200 as a debit for the check when in actuality, that particular check had a monetary amount of $150. With the 200 DR entered, the Subtransaction Total indicates a debit of 50 (+) instead of the correct 0 shown for item number (8) in Example #1. With a 150 (-) at item number (7) and with a 200 DR at item number (8), the software in the terminal 10 recognizes that an error has occurred (showing an "overdraft" of 50 (+)) and accordingly, an error tone 46 of the terminal 10 is actuated to warn the operator of this error. In other words, at this time, there is either an error in the subtotal entered at item number (5) or there is an error in the entry of one of the monetary amounts of the checks entered at item numbers (6)-(8).

In order to find out where the error lies for the error mentioned on item number (8) of Example #2, the operator has several options under the method of this invention. In the first option, the operator actuates the Subtotal key 30-2; this action provides a subtotal for the Proof Total, and is shown starting at item number (9). Item (9) provides a total of 650(+) for the debits for the checks processed to this point, while item (10) provides the total of credits which is 1000(-) which is represented by the deposit slip from item number (1). The terminal 10 subtracts these two subtotals, leaving an out-of-proof (oop) situation of 350(-) as shown at item number (11). This figure in itself is not definitive of any error, so the operator then proceeds to the second option to obtain the Subtransaction Totals initiated at item number (12). The Subtransaction Totals are initiated by the operator actuating both the Non Add key 30-3 and the

Subtotal key 30-2 at the same time. The software of the terminal 10 will then total the debits to arrive at a total of 550(+) which represents the monetary amounts of the checks of group #2 which were entered at item numbers (6)-(8). The total credits consist of a sum of 500(-) which was entered at item number (5) and which represents the subtotal appearing on the adding machine tape which surrounds the checks of group #2; this credit of 500(-) appears at item number (13). The terminal 10 subtracts the debits from the credits, leaving an out-of-proof situation of 50(+) shown as item number (14). This indicates to the operator that the operator should look for a difference of $50 which was overstated, perhaps, on a single check. In this example being discussed, the operator did in fact enter a debit of $200 at item number (8) when the actual amount on the check was $150 as previously indicated.

To correct the $50 error associated with item number (8) in Example #2, the operator essentially "takes out the improper value and enters the proper value or monetary amount of the check". To effect this, the operator actuates a Reverse Enter (RV-EN) key 30-4, as shown at item number (15), and thereafter enters the $200 as a debit using debit key 30-5. Notice that the Proof Total of 350(-) from item number (8) is increased by the amount of $200 to provide a total of 550(-) because this amount of $200 had been reverse entered. Correspondingly, the $200 is reverse entered to the Subtransaction Total of 50(+) from item number (8), leaving a revised balance of 150(-) as shown at item number (15). The proof light 44 would be "S", indicating that the operator is again in a subtransaction.

At item number (16), the operator enters the correct monetary amount of $150 of the check in question as 150 DR. Because this value is subtracted

from the 150(-) shown at item number (15), the Subtransaction Total is shown correctly as 0. The terminal 10 then actuates the printer 28 to print the symbol (=) on the journal tape 42, and the light 44 changes to "F" to notify the operator to check the journal tape 42 and to indicate the end of processing for a group of documents (Subtransaction #2 balances).

Item numbers (16), (17), and (18) in Example #2 are identical to item numbers (9), (10), and (11) shown in Example #1. Because the entries associated with the item numbers (16), (17), and (18) were entered properly, no additional discussion of these item numbers is deemed necessary.

Another type of out-of-proof error is shown in Example #3. In this example, the monetary amount on a check is misread and a sum is entered which is less than the actual amount of the check. Notice in Example #2, at item number (8) thereof, the amount of the check which was entered (200 DR) was more than the actual amount on the check ($150). Example #3 is identical to the example portrayed in Example #2 except as pointed out hereinafter.

Example #3

IT. NO.	ENTRY	PROOF TOTAL	SUBTRANS-ACTION TOTAL	JOURNAL	PROOF LIGHT
(1)	1000 CR	1000(-)	0		O
(2)	100 NA ST	1000(-)	100(-)		S
(3)	50 DR	950(-)	50(-)		S
(4)	50 DR	900(-)	0	(=)	F
(5)	500 NA ST	900(-)	500(-)		S
(6)	100 DR	800(-)	400(-)		S
(7)	250 DR	550(-)	150(-)		S
(8)	100 DR	450(-)	50(-)		S

(9)	400 NA ST	400(-)			S *
(10)	Proof Subtotal	T-DR	550(+)		
(11)		T-CR	1,000(-)		
(12)		oop	450(-)		
(13)	Subtransaction Subtotal	T-DR	450(+)		
(14)		T-CR	500(-)		
(15)		oop	50(-)		
(16)	RV-EN				
	100 DR	550(-)	150(-)		S
(17)	150 DR	400(-)	0	(=)	F
(18)	400 NA ST	400(-)	400(-)		S
(19)	150 DR	250(-)	250(-)		S
(20)	250 DR	0	0	(<>)	O

* Error Tone

The items associated with item numbers (1)-(7) are identical to the items already discussed in relation to Example #1 and Example #2. Notice in item number (8) of Example #3 that the operator entered 100 DR for a check whose monetary value was actually $150. When this is done, there is still a credit value of 50(-) under the Subtransaction Total. As far as the terminal 10 is concerned, it still anticipates that perhaps another check for $50 is yet to be entered for that particular group of documents being processed. However, when the operator starts to process the third group of checks as shown by item number (9), the terminal notices that an error has occurred. This is because there is a new subtotal being entered for the next group of documents, and there still is a balance of 50(-), indicating that at least one more check has to be entered for the prior group of checks. The error tone 46 warns the operator at item number (9) that an error exists.

In correcting the error discovered at item number (9) of Example #3, the operator obtains the Proof Total at item numbers (10)-(12) as previously discussed in relation to Example #2. For the next step, the operator obtains the subtransaction total as shown by item numbers (13)-(15) as previously discussed in relation to Example #2. However, in this example, item number (15) of Example #3 indicates that the subtransaction out-of-proof amount is a 50(-). The operator now suspects that the error originated by understating the amount of a check or checks by $50. After looking through the second group of checks, the operator finds that a check with a monetary value of $150 thereon was entered as a debit of $100. The items shown in the examples, like Example #3, are shown on the journal tape 42 to facilitate the checking. At item number (16), the operator reverse enters the $100 as a debit. This raises the Proof Total of 450(-) at item number (8) to 550(-) as shown at item number (16). The reverse entry also raised the Subtransaction Total from 50(-) at item number (15) to 150(-) at item number (16). When the operator correctly enters the $150 check in question as a 150 DR at item number (17), the Subtransaction Total for that group of checks reflects a "0", and an (=) sign is printed on the journal tape 42 as previously discussed. The proof light 46 now flashes to remind the operator to check the totals on the journal tape 42. The remaining item numbers (18)-(20) of Example #3 correspond to item numbers (17)-(19) of Example #2, and consequently, they do not need further discussion.

The following example will show how the method of this invention processes an error which is associated with the one deposit slip which accompanies a group of checks.

Example #4

IT. NO.	ENTRY	PROOF TOTAL	SUBTRANS-ACTION TOTAL	JOURNAL	PROOF LIGHT
(1)	1000 CR	1000(-)	0		O
(2)	100 NA ST	1000(-)	100(-)		S
(3)	50 DR	950(-)	50(-)		S
(4)	50 DR	900(-)	0	(=)	F
(5)	500 NA ST	900(-)	500(-)		S
(6)	100 DR	800(-)	400(-)		S
(7)	250 DR	550(-)	150(-)		S
(8)	150 DR	400(-)	0	(=)	F
(9)	300 NA ST	400(-)	300(-)		S
(10)	50 DR	350(-)	250(-)		S
(11)	250 DR	100(-)	0		F
(12)	200 NA ST	100(-)	200(-)		S
(13)	100 DR	0	100(-)		S
(14)	100 DR	100(+)	0		F
(15)	2000 CR <--- Entry Error				*
	CLEAR KEY 30-8				
(16)	RV-EN				
	1000 CR	1100(-)	0		F
(17)	1100 CR	0	0	(<>)	O

* Error Tone

The entries for item numbers (1)-(14) for Example #4 are analogous to the entries made in the prior examples given; however, an error is discovered at item number (15). Notice that at item number (14) the Subtransaction Total balances out to a "0"; however, there is an "overdraft" situation associated

with the Proof Total in that a balance of 100(+) appears instead of a credit value (-) or a "0". When the operator enters the next deposit slip for new groups of documents as indicated at item number (15), the terminal recognizes that an error has occurred and it energizes the error tone 46. At item number (15), the operator actuates a Clear key 30-8 to clear the entry error. The operator then reverse enters the 1000 (credit from item number (1)) at item number (16). Because the subtotals for each group of checks and the individual checks for each of the groups of checks have balanced under the Subtransaction Total column of Example #4, the operator knows that the deposit slip is in error. The 100(+) at item number (14) indicates that the correct amount for the deposit slip is 1000 plus this $100 amount, making the correct amount for the deposit slip $1100. The operator then enters the $1100 as a credit at item number (17) to put the proofing operation in balance. The E-REL entry at item number (17) stands for Error Release and it is made by actuating an Error Release key 30-7 shown in the figure. The operator then re-enters the 2000 CR associated with the second deposit slip and proceeds with routine processing of that second batch of checks.

There is another illustration which may prove helpful in showing the versatility of the method of this invention. This is a situation in which there is a mix of cash deposits and batches of checks to be processed according to the subtotal balancing of this invention. Example #5 illustrates this feature.

Example #5

IT. NO.	ENTRY	PROOF TOTAL	SUBTRANS-ACTION TOTAL	JOURNAL	PROOF LIGHT
(1)	1000 CR	1000(-)	0		O
(2)	50 Dr	950(-)	0		
(3)	100 NA ST	950(-)	100(-)		S
(4)	50 DR	900(-)	50(-)		S
(5)	50 DR	850(-)	0	(=)	F
(6)	100 DR	750(-)	0		F
(7)	150 DR	600(-)	0		F
(8)	175 DR	425(-)	0		F
(9)	400 NA ST	425(-)	400(-)		S
(10)	150 DR	275(-)	250(-)		S
(11)	150 DR	125(-)	100(-)		S
(12)	RV-EN DR 150 DR	275(-)	250(-)		S
(13)	250 DR	25(-)	0	(=)	F
(14)	25 DR	0	0	(<>)	O

In Example #5, some of the deposits to be entered are made in the form of "cash" instead of checks. In this regard, item numbers (2), (6), (7), (8) reflect cash deposits or single checks with no subtotal. The cash deposits, like 50 DR, for item #2 are simply subtracted from the Proof Total. Notice that there is no NA ST entry made for cash as there is for a group of checks associated with item numbers (3)-(5), for example, or item numbers (9)-(11).

At item number (11) in Example #5, the operator knows that an error has occurred because the operator knows that, physically, there are no more checks included in the bundle of checks being processed, and the Subtransaction Total shows a balance of 100(-) when it should read 0 if no entry errors occurred. This indicates an error in the subtotal on the adding machine tape for the group of checks or it means at least one error in entering the amounts on the checks. From the Subtransaction Total of 100(-), the operator surmises that a check was probably understated by a value of $100. The operator finds the check and sees that the correct amount is $250 instead of $150. At item number 12, the operator uses the Reverse Enter key 30-4 to reverse enter the $150 which leaves the Proof Total at 275(-) and the Subtransaction Total at 250(-). At item number (13), the operator enters the correct monetary amount of the check, resulting in a 0 at the Subtransaction Total as previously discussed. At item number (14) the operator enters 25 DR for the last cash deposit for this deposit, resulting in a 0 in the Proof Total and a 0 for the Subtransaction Total. The special mark (<>) is then printed on the journal tape 42 as previously discussed. When the last balancing is effected for a group of documents, the (=) sign is not printed, and in its place, the special mark (<>) is printed. This is seen most clearly at item number (11) for Example #1.

As stated earlier herein, one of the features of this invention is that it permits reconciliation aids to be used when encountering an out-of-proof condition. Reconciliation aids won't work if an out-of-proof condition exists in the "adding machine mode" of operation mentioned earlier herein. A reconciliation aid is an algorithm, for example, which facilitates finding where an error is located.

Naturally, if found necessary or desirable, what is considered a debit and what is considered a credit may be reversed herein without departing from the principles of this invention.

Most proof machines, like 10, run in a "credits first" mode. The description of the invention presented herein was given as a "credits first" mode. A "debits first" mode occurs when all the debits are entered first, and thereafter, the associated credit is entered. The present invention works equally well in the "debits first" mode. The main difference when this invention is operated in the "debits first" mode compared to the "credits first" is that the Proof Total will be (+) until the credit is entered.

What is claimed is:

1. A machine method of balancing credit and debit transactions associated with documents in which one credit document and more than one group of debit documents are provided; each document of said group of debit documents having a numerical value associated therewith and each said group of debit documents having a subtotal associated therewith, with the subtotal representing the sum of the numerical values of the documents included in that group of debit documents, and with said one credit document having a total which represents the sum of the subtotals of each said group of debit documents, said method comprising the steps:

(a) entering on a machine a credit, as a negative transaction, said total from said credit document,

(b) entering on said machine a credit, as a negative transaction, one of said subtotals associated with a group of debit documents to be balanced;

(c) entering on said machine a debit, as a positive transaction, the numerical value of a first document included in the group of documents mentioned in step (b);

(d) using said machine when in a first mode of operation to subtract said numerical value mentioned in step (c) from the subtotal mentioned in step (b) to arrive at a subtransaction total, and to also subtract said numerical value mentioned in step (c) from said credit mentioned in step (a) to arrive at an overall running total or second output;

(e) repeating steps (c) and (d) for the documents remaining in the group mentioned in step (b);

(f) checking said subtransaction total to determine whether or not subtracting said debits of said documents in the group of documents mentioned in

step (c) results in an output which is equal to zero for the group of documents from group (b);

(g) repeating said steps (b), (c), (d), (e), and (f) for the groups of debit documents associated with said credit document; and

(h) checking said second output of said machine to determine whether or not said second output is zero when all the debit documents for all the groups of debit documents have been processed in step (g).

2. The method as claimed in claim 1 in which said step (f) is effected by printing a predetermined character on a print out sheet associated with said machine, with said predetermined character being equivalent to an output of zero for the group of documents from group (b).

3. The method as claimed in claim 2 in which said step (h) is effected by printing a second predetermined character on said print out sheet to indicate that said second output is zero.

4. The method as claimed in claim 3 in which said method is effected using a bank proof machine.

5. The method as claimed in claim 1 in which said step (b) is effected by entering one of said subtotals without affecting the total entered at step (a).

6. The method as claimed in claim 5 in which said step (b) is effected by actuating a Non Add Subtotal key and a Subtotal key.

7. The method as claimed in claim 5 in which said checking step (f) results in a non-zero value in said subtransaction total which indicates the presence of an error in said subtransaction total and in which said checking step (f) further includes the steps of:

(f-1) obtaining a subtotal of the positive transactions from said documents in said group of documents and the associated negative transaction or subtotal from step (b);

(f-2) subtracting the negative transaction from the subtotal of positive transactions from step (f-1) to obtain an out-of-proof amount associated with said group of documents from step (f-1);

(f-3) subtracting the subtotal of the positive transactions from step (f-1) from said overall running total of step (d) to obtain an out-of-proof total for said second output;

(f-4) printing the out-of-proof amounts from steps (f-2) and (f-3) on a print out sheet to facilitate finding an error in entering said credit and debit transactions.

8. The method as claimed in claim 8 in which correcting said error mentioned in step (f-4) is effected by reverse entering said error into the subtransaction total associated with said group of documents mentioned in step (f-2) and reverse entering said error into the overall running total mentioned in step (f-3); and

(f-5) re-entering the correct numerical value for said error.

9. The method as claimed in claim 8 in which said method is effected on a bank proof machine.